# 7.3 Solving By Graphing

## Solving Quadratic Equations by Graphing [7.3]

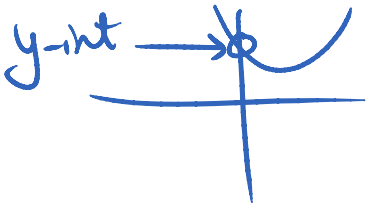
Complete my thoughts…

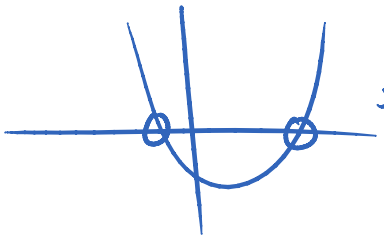
- Y-intercept means $x = 0$ and that is where the graph crosses the y axis.

Sooo….

- X- intercept must be when $y = 0$ and that is where the graph crosses the x axis.

Draw me a sketch:




Solution for 1 equation is where the line crosses the x-axis

Example 1: y-int. → x = ?

Solve $x^2 - 4x + 3 = 0$ by graphing and determine the zeros. ← the solutions ← where crosses x-axis

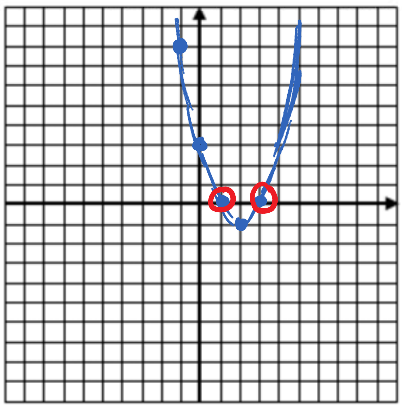


table of values

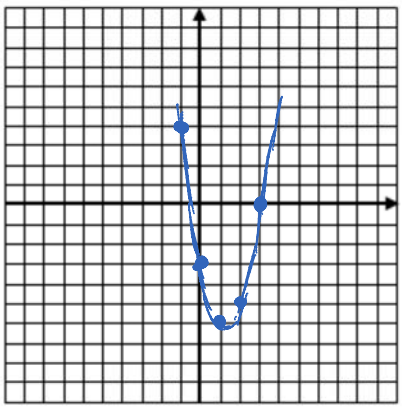
| x | y | |
|---|---|---|
| -3 | 24 | ignore |
| -2 | 15 | ignore |
| -1 | 8 | |
| 0 | 3 | ← y-int |
| 1 | 0 | ← x-int |
| 2 | -1 | |
| 3 | 0 | ← x-int |

Solutions are: 1 and 3 → where the line crosses the x-axis

Example 2:

Solve $2x^2 - 5x - 3 = 0$ by graphing and determine the zeros. — solutions, x = ? — where crosses x-axis

x = ?



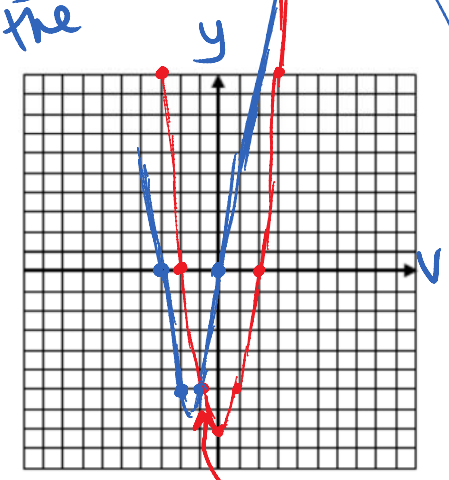
| x | y |
|---|---|
| -1 | 4 |
| 0 | -3 |
| 1 | -6 |
| 2 | -5 |
| 3 | 0 |

Solutions
x = 3
x ≈ -0.5

Example 3:

Solve $3v(v+3) = 2(v^2-4)$ by graphing the expressions on both sides of the equation.

Solution for 2 equations is where the 2 lines cross each other




$y = 3v(v+3)$

| v | y |
|---|---|
| -3 | 0 |
| -2 | -6 |
| -1 | -6 |
| 0 | 0 |
| 1 | 12 |
| ⋮ | ⋮ |

$y = 2(v^2-4)$

| v | y |
|---|---|
| -3 | 10 |
| -2 | 0 |
| -1 | -6 |
| 0 | -8 ← vertex |
| 1 | -6 |
| 2 | 0 |
| 3 | 10 |

Solution: where the lines cross

(-1, -6)

$3v^2 + 9v = 2v^2 - 8$

$1v^2 + 9v + 8 = 0$

$v^2 + 9v + 8 = 0$

$(v+8)(v+1) = 0$

$v = -8$ or $v = -1$

Solutions

$v = -1$

$v = -8$

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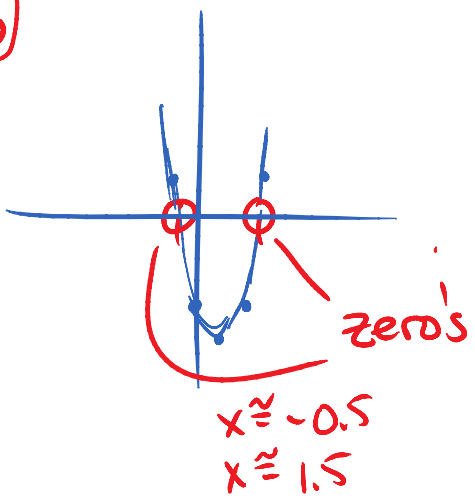
(13 - we'll do together)

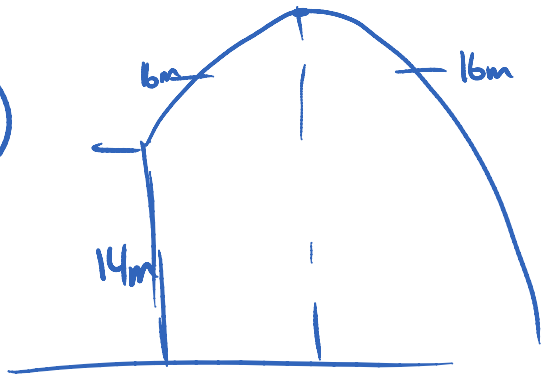
5a)

| x | y |
|---|---|
| -3 | 38 |
| -2 | 17 |
| -1 | 2 |
| 0 | -7 |
| 1 | -10 ← |
| 2 | -7 |
| 3 | 2 |

$3x^2 - 6x - 7 = 0$




7)

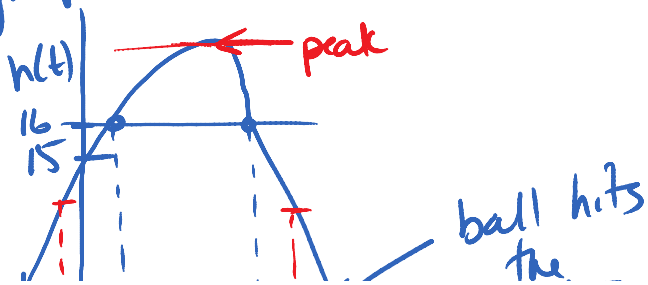


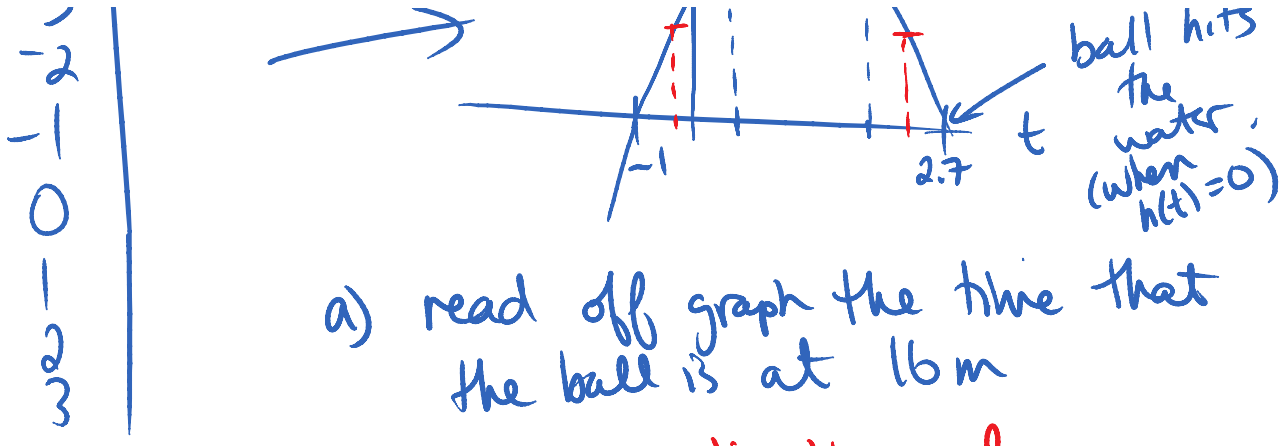

$h(t) = -4.9t^2 + 8t + 14$

~~ft~~ ↑

① graph the function

| x | y |
|---|---|
| -3 | |
| -2 | |






a) read off graph the time that the ball is at 16 m

b) read off positive time only

(10) $4x^2+3x-2 = -2x^2+5x+1$

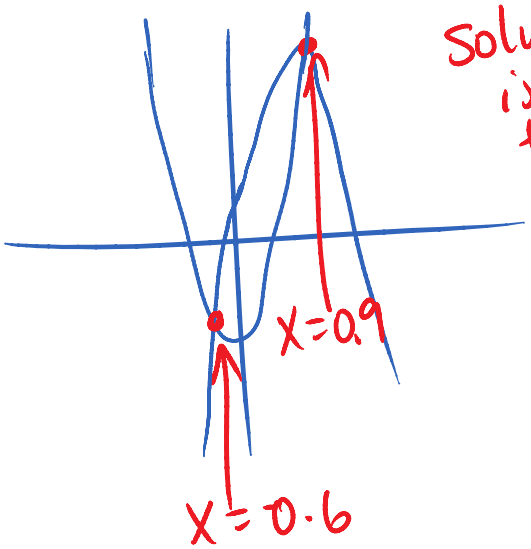
a) graph both sides separately

$y = 4x^2+3x-2$

$y = -2x^2+5x+1$

| x | y |
|---|---|

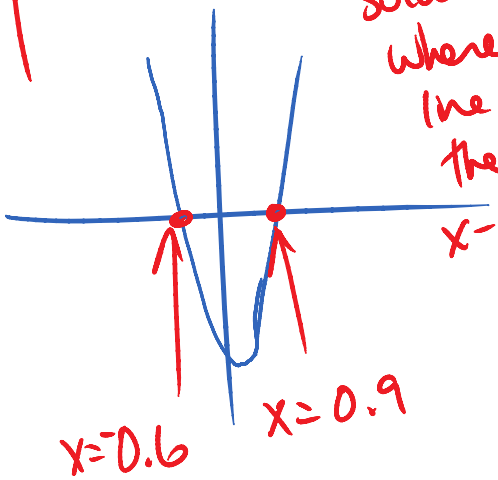
| x | y |
|---|---|




Solution is where the lines cross

b) $6x^2-2x-3 = y$

| x | y |
|---|---|




Solution is where the line crosses the x-axis

✓

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## Factored Form of a Quadratic Function [7.4]

**QUADRATIC**

$ax^2 + bx + c$

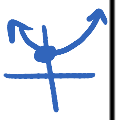
$a \neq 0$

$a<0$ $a>0$

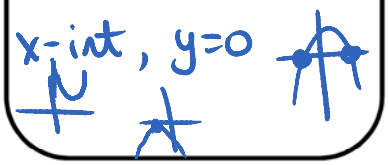
**INTERCEPT**

- where the graph crosses an axis

y-int, $x=0$



x-int, $y=0$

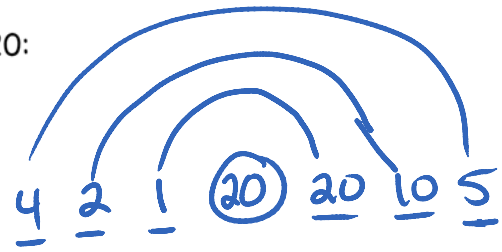


**FACTOR**

Doing today

Let's review some factoring:

List the factors of 20:




The GCF = Greatest Common Factor

Try these:

$5x^2 + 10x$

$5x(x + 2)$

$3x^2 + 3x - 36$

$3(x^2 + x - 12)$

$3(x+4)(x-3)$

Factoring Trinomials - What do you remember?

- Take out the GCF first
- factor into 2 brackets ( )( )

Try these:

An easier one > $x^2 + x - 6$

$= (x+3)(x-2)$

Harder one > $2x^2 + 3x - 2$

$= 2x^2 - 1x + 4x - 2$

$= x(2x-1) + 2(2x-1)$

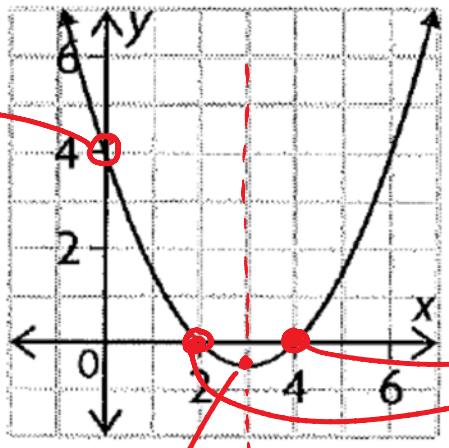
$= (2x-1)(x+2)$

| + | x |
|---|---|
| 3 | -4 |

-1, 4

Looking at this graph, what characteristics do you think are important & why?

(Feel free to write / sketch/ indicate/ etc to get your point across)




y-int
$x = 0$

positive quadratic (opens up)

x-intercepts
$y = 0$

Domain $x \in R$
Range $y \geq -0.5$

vertex (3, -0.5)
minimum
turning point

axis of symmetry
$x = 3$

x-intercepts, add and divide by 2

$\frac{2+4}{2} = 3 = x$

When a quadratic function is written in factored form

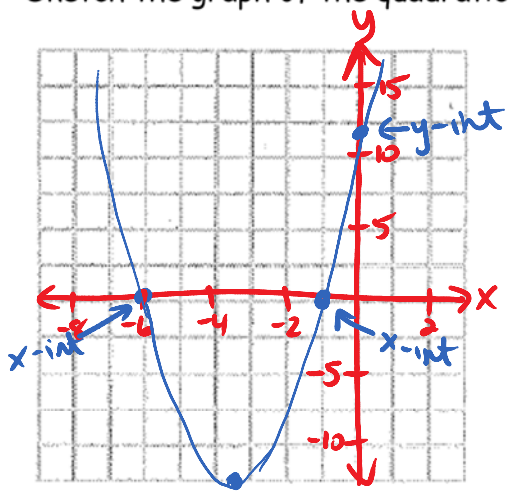
$y = a(x - r)(x - s)$

r and s are the x-intercepts

Example 1:

Sketch the graph of the quadratic function: $f(x) = 2x^2 + 14x + 12$

0 positive y-int




① Factor - GCF?

$= 2(x^2 + 7x + 6)$

② Factor into 2 brackets

$= 2(x+6)(x+1) = 0$

③ Find x-int (zeros) by looking at each factor individually

$x+6=0$ $\quad x+1=0$

$x=-6$ $\quad x=-1$

x-intercepts

④ Vertex:

→ find midpoint of x-intercepts

$\frac{-6+-1}{2} = \frac{-7}{2} = -3.5$

⑤ find the y-value of vertex

$y = 2x^2 + 14x + 12$

$= 2(-3.5)^2 + 14(-3.5) + 12$

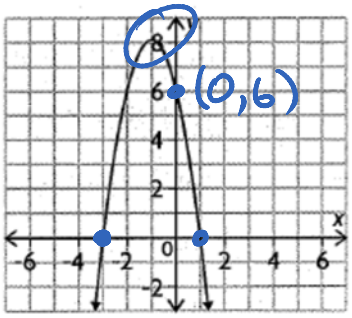
$= -12.5$

vertex $(-3.5, -12.5)$

Example 2:

Determine the quadratic function that defines this parabola. Write the equation of the function in standard form.

$Ax^2+Bx+C=y$




Factored Form

$y = a(x-r)(x-s)$

x-int = $-3$ and $1$

$y = a(x+3)(x-1)$

plug in y-intercept (or any point from the graph line)

$6 = a(0+3)(0-1)$

$6 = a(3)(-1)$

$\frac{6}{-3} = a$

$-2 = a$

Now: $y = -2(x+3)(x-1)$

multiply out to get general form

$= -2(x^2+2x-3)$

$y = -2x^2-4x+6$

↑ ✓ ↑ y-int ✓

Partial Factoring

- if started with $y = -2x^2-4x+6$

$y = -2x(x+2)+6$

if $x=0$, $y=6$

if $x=-2$, $y=6$

∴ axis of sym = $\frac{0+-2}{2} = -1$

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axis of sym = $\frac{b}{2a} = -1$

vertex - plug in -1 for x

$y = 8$

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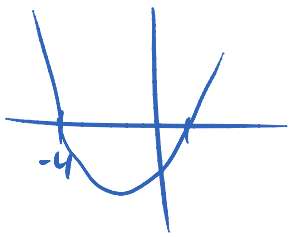
#1, 2, 4ace, 9, 10, 11a, c, 16

1a) $f(x) = (x-1)(x+4)$

+1 , 1 , -4

iii)




e) $f(x) = (1-x)(x+4)$

$(1-x) = -1(x-1)$

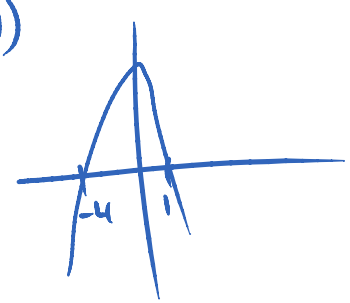
$= -x + 1$

$= (1-x)$

$= -1(x-1)(x+4)$

1 , -4

iv)

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#1, 2, 4, 5, 8, 9, 11